VOLUME 79 SEPARATE No. 341

PROCEEDINGS

AMERICAN SOCIETY
OF
CIVIL ENGINEERS

NOVEMBER, 1953

WHAT'S THE OUTLOOK FOR SANITARY ENGINEERS?

by Clarence W. Klassen

SANITARY ENGINEERING
DIVISION

{Discussion open until March 1, 1954}

Headquarters of the Society
33 W. 39th St.
New York 18, N. Y.

PRICE $0.50 PER COPY

This paper was published at 1745 S. State Street, Ann Arbor, Mich., by the American Society of Civil Engineers. Editorial and General Offices are at 33 West Thirty-ninth Street, New York 18, N. Y.

WHAT'S THE OUTLOOK FOR SANITARY ENGINEERS?[1]

Clarence W. Klassen
Chief Sanitary Engineer
Illinois Department of Public Health

If I were to select a creed for the outlook of the sanitary engineer it would begin with the words "I know."

I know that bodily health is necessary to continued and effective work and that health is the most natural thing in the world.

I know I am living in a world where nothing is permanent but change and that I can help change the environmental way of living so my fellow men can enjoy a longer and healthier life.

I know I am influenced by the examples and work of men who are no longer alive and that the work I do can, in a degree, influence people who may live with and after me to enjoy the investments in and profits from living in a clean community.

I know that to improve my own professional status, I must practice mutuality within my profession and those allied with it.

I know that the reward which is held out for my work is not rest, nor immunity from work or solely monetary remuneration, but rather the increased capacity for my fellow men to help attain and maintain man's most precious possession--HEALTH.

Regardless of what branch of the engineering profession we are considering, the outlook or future prospects of its members is essentially determined by four basic factors: first, by those particular characteristics or necessary qualifications peculair to him and which especially fits him to accomplish certain tasks; secondly, the scope of his field of activity and his particular role in it; thirdly, the real potentialities of his sphere of activities; and lastly, his concept or interpretation of these potentialities and his efforts to develop them to their fullest usefulness.

First, what are these particular technical skills which peculiarly differentiate a person known as a sanitary engineer and theoretically gives him the proficiency to contribute his talents to aid his fellow men to attain this priceless possession called health?

A sanitary engineer is a person who has fitted himself by training, study, or experience to conceive, design, or operate engineering works developed

1. Presented at Engineers' Centennial Celebration (Joint session of Sanitary Engineering Division, American Society of Civil Engineers and Engineering Section, American Public Health Association) Chicago, September 9, 1952.

for the protection and promotion of public health or capable of injuring the public health through faulty conception, design construction or operation. The ability to identify and evalute in terms of their public health implications, factors connected with such engineering works that will prevent injury to health or promote health constitutes the basic differentiation between sanitary and other branches of engineering such as civil, mechanical, electrical or chemical engineers.

The target objective of the sanitary engineer is to preserve health, but the preservation of health is based on prevention of disease and prevention is a difficult thing to precisely evaluate, for it is measured in seemingly abstract and apparently intangible terms of what does not happen rather than what does. Thus to engineers accustomed to dealing in the material and tangible, it is often difficult to translate engineering principles and integrate their application into terms of what is called "health services." Especially in the case of the younger sanitary engineers this difficulty is more conceivable, particularly so if they are employed in a health organization administratively dominated by those who attempt to rationalize their own inadequacies and ineffectiveness by conveniently hiding behind this nonexistent cloak of "intangibility." Health is tangible, it is real, the sanitary engineer must first of all recognize and believe this and not be erroneously influenced and detered in this concept. This is professionally essential—for health is the most natural thing in the world. It is natural to be healthy, for, are we not part of nature? Nature needs man so that he can be useful to other men. The very definition of engineering, "harnessing the forces of nature for their use and convenience of man," makes the role of the sanitary engineer a natural one.

The practice of what we today call public health is founded upon two basic services to the public. All efforts to secure health protection fall into two categories, (1) personal health services or those directed toward the individual and (2) environmental health services or those relating to the control of our environment. Both of these have been the outgrowth of two definite concepts, one held principally by the medical profession is that doctors symbolizing curative medicine are the dominant force necessary to attain good health, the other, that through the application of sanitary science to environment, significant results will be produced in securing and improving health beyond the capacity of the individual private practitioner. This latter approach can be termed "mass protection" where through individual action by a sanitary engineer on a phase of our environment, health protection is given to many. This type of "mass health protection" by individual action contrasted with "individual health protection," by individual action is the basic public health difference in the approach to disease prevention by the sanitary engineer as compared with that of his medical counterpart.

Over 3,000 years ago man probably first began to realize that his life could be materially preserved if he observed certain basic rules in keeping his surroundings or environment clean. The early nomads pitched camp where natural waters abounded and if the supply became fouled or when his refuse accumulated to make living a hazard, he moved. An early sign of civilization was when he remained in one locality—then cleanup days became a vital necessity. When conditions of accumulated filth eventually caused him to fear his well-being, necessity made him learn more about what we now call sanitation. Thus, the science of sanitation, the cornerstone on which our modern structure of sanitation is built was borne of a sheer need to survive. Sanitation became a MEANS of living.

The evolution of the science of sanitation, which has undergone three

principal cycles of development, is important to our outlook for the keys to sanitation vistas of the future often involve views through doors that have been unlocked in the past.

From early public health history until the early 1900's could be termed "the period of justification or fear" where action was primarily justified on the basis of an epidemic that had occurred or the fear that one would develop. The next thirty years might well be termed "the period of methodization," where prevention of disease was accelerated and accomplished through the development and perfection of advances in sanitary techniques. These advances centered principally around such environmental vitalities as the protection of water supplies, the proper collection and disposal of human wastes, the protection of milk and food, all of which are still basically essential to health protection and survival.

Just prior to World War II a new concept, yes, a new era in sanitation was approaching and with it the need for a broader concept of his job by the sanitary engineer. This new era, reflecting the times, can, for the want of a better name, be termed "the period of socialization" or perhaps preferably "humanization." Here, conditions of our environment which had heretofore not been considered as basically essential to our survival were beginning to gain attention and prominence among the more progressive and aggressive health agencies. A broader interpretation of health was making its appearance. The presence of health rather than the absence of disease was keynoted. The ability to enjoy a more comfortable life in clean surroundings was looked upon as a reality. Sanitation thus became a WAY of living as well as a MEANS of living.

The advances in sanitation which are synonomous with the advances in the sanitary engineering profession depend in a great measure and revolve around this broadening concept of sanitation and our development of its potentialities. We must, however, recognize that it is bound up in the administrative practices of public health, for today the administration of public health sets the pace for this mass protection and quality living. Today we still find many health agencies operating on the premise that sanitation is merely a MEANS rather than a WAY of living. Many health agencies, yes, some unfortunately through the influence of their own sanitary engineers, are limiting the potentialities of a sanitation program and thus helping to shackle the sanitary engineering profession by picturing sanitation and its future as an engineering technique or method, an individual or an organization, an ordinance or regulation, instead of as a way of man living with man. Sanitation today offers one of the greatest challenges and opportunities in the field of engineering—the challenge and opportunity to transform the findings of the physical science of engineering into terms of healthful living through improved environment.

Sanitation has an illustrious past—its accomplishments are linked with the names and contributions of many "giants" in engineering. Sanitation has advanced—it is not a static activity. Our accomplishments have been recounted during this centennial but let us not dwell too much on past accomplishments for once this process starts the period of dynamic work is close to its end. Sanitation and the sanitary engineering profession will advance—yes, if necessary, in spite of some within the profession who may lack the vision of its potentialities, and some administering public health who either cannot or chose not to acknowledge its achievabilities. However, in an activity so closely woven into our daily living, the public itself is quick to recognize not only the needs but also the faults and shortcomings in a governmental health agency not meeting these recognized needs. We in sanitary engineering

cannot defend a nonprogressive sanitation program either from the technical or administrative standpoint, nor elevate the status of our profession by the mere pointing of a finger at weak links in our profession. Neither can we rest on any past laurels—a record of past achievements is not enough. We cannot just look back to great technical yesterdays—we must look forward to great technical and administrative tomorrows. In the words of Justice Holmes "We must sail—sometimes with the wind, sometimes against it, but we must sail and not drift or be at anchor."

An appraisal of a program of sanitary engineering activities on the basis of what the people have a right to expect will not only chart the course for our future but will also determine whether we in sanitary engineering are proceeding with a "short sail" and exposing our course to hazardous "cross winds" from "guild conscience" origins.

Today's challenges to the sanitary engineer to "produce" are real—made real by the expectations of a public becoming aware of the benefits it can derive from a complete sanitation program embracing all phases of our environment.

As a way of living, people have come to expect not only sheer prevention of specific disease, but the right and opportunity to share the profits of living in a clean community. In any governmental health jurisdiction, wherever it exists, local, state or federal, the people of that community have a right to expect their sanitation services administered by persons occupying those administrative and technical positions solely because they are qualified. The people likewise have a right to expect a sanitary engineering program so well rounded and practically administered that it will result in controlling all phases of their environment. The public is entitled to know what they receive for that portion of their dollar expended for sanitation and in a health jurisdiction to know that sanitation is receiving its share of the available funds commensurate with the important vitalities it represents to daily living.

While the sanitary engineer "must know," the public is not primarily concerned with what a sanitary engineer knows or how many hours of graduate work or professional degrees he has accumulated through academic training. The public is more concerned with what he is doing with that knowledge to improve their environment and thus their way of living.

Why does sanitary engineering hold such promise—what is our real product and what can we really sell, promote and offer as a result of our years of professional training and experience in sanitation? In addition to the specific prevention of environmental-borne diseases, we can offer a quality of healthful living that touches the lives of every living person and will affect the living of the yet unborn. Is there another engineering activity that holds such a challenge—such an outlook?

Modern sanitation on which the future of the sanitary engineer must be built is more than water and sewage. While such problems must be reemphasized and not deemphasized and now and always will be of functional importance in our profession, in the modern concept of environmental control they are but links in the ever-lengthening chain of sanitation activities. Our outlook must be based upon a complete modern sanitation program which encompasses all phases of our environment and which includes seven major fields of activity: these are water, wastes, air, shelter, food, natural hazards, and man-made hazards. One or more of these touch the lives and well-being of every person, without exeption, for these represent WHERE and HOW we live. This expansion and change in "tempo" in the sanitary engineer's concept of environmental

control can best be illustrated by a few specific examples of trends and problems both current and those on the horizon. I especially like the term "horizon" and its implications to future problems—for the horizon is that place where the sky and ground appear to meet, a point actually out of reach, so it represents an ever-present goal or objective. It does, however, symbolize a type of approach to future problems admittedly utopian in character but one which does embody certain essential characteristics. That place where, if the sanitary engineer is to improve his essential status in our modern civilization, he can have his head in the clouds and still keep his feet on the ground.

Freedom from potential disease and the prevention of illness will continue to be of prime concern to the sanitary engineer. While admittedly frequently difficult to evaluate, the true value of prevention can often only be determined and concretely shown to the public by the consequences where proper preventive measures were not practiced. Thus to sanitary engineers, epidemics of disease are of extreme importance for they are in a sense the yardsticks by which the true value of his work can be measured. They can become important tools in his hands to mold and build public opinion. Epidemics are of two-fold importance— they embody both the concrete evidence of what can happen where proper sanitation precautions were not followed or ignored, and, conversely, afford an opportunity to demonstrate that the illness could have been controlled by following accepted sanitation practices. In some few epidemics when legal action results, testimony and court decisions make contributions which are of extreme importance and usefulness and can serve as guide posts for the tomorrows.

Sentiment and objective idealism in the right proportions are all right and are needed in our outlook to the future but to an engineer both must be used as the warp and woof of the practical.

Water

One of the earliest environmental activities and still one of basic practical importance is the control of drinking water supplies and this field is replete with practical examples of the "new look" at sanitation. If I were to select a theme for this phase of this paper, it would paraphrase the words of a famous statesman by saying "A water supply is the foundation upon which rests the health and progress of a people and the protection of that supply should be the first duty of every citizen." The interpretation of the term "protection" is all important to the sanitary engineer and his future. To him it must mean the safeguarding of principles upon which a successful supply is based such as adequacy, physical, sanitary and mineral quality. The proper concept of these are now more than ever important when a variety of interpretations are being advanced often by persons outside of our engineering profession in an attempt to further "socialize" this vital utility. How far we should go in "socializing" our water supplies for various local needs involves many interesting questions—questions impinging on the future of sanitary engineering. The idea of mass protection through mass treatment utilizing the public water supply as a medium is not too foreign to some of our present trends in the direction of what some may term "socialized medicine." However, mass protection through preventing water-borne illness is destined to occupy the major thinking of the sanitary engineer for some time in the future.

Until recently the only recognized water-borne human illness have been those involving the intestinal tract, typhoid, dysentery, and cholera. There are, however, indications in the outlook for sanitary engineers that other diseases might be considered in the future as water-borne even though at present there is only obscure evidence pointing in that direction. It does emphasize the need for open-mindedness on the part of sanitary engineers in public health. Let me cite a few examples.

Shistosomiasis was not common in the sanitary engineer's water supply vocabulary until World War II and our Pacific operations. A few people knew the disease as one affecting our blood stream and one confined to remote parts of the globe. The infection is secured by wading, swimming, or drinking water affected with cercaria, a free swimming larval stage of a parasitic worm. We already have its "first cousin" known as "swimmer's itch" in our northern waters. A species of snail acts as its host. Whether or not a specific snail in this country can act as the host is not definitely known and much work remains to be done to assure a break in any chain that would complete this cycle for humans in this country.

This again serves to illustrate "the professionally open-mindedness" needed by the sanitary engineer of tomorrow to recognize the value and need of the biologist as an integral part of his working team.

Infectious hepatitis (infection of the liver), commonly known as jaundice, has a more conclusive water-borne history. The causative virus is known to be included in the feces of affected persons. An epidemio-logical study of the outbreak in 1934 in this country involving 350 persons at a girl's camp concluded that the infection was transmitted to the majority of cases by water from a camp well.

Tularemia is normally thought to be transmitted from animals to man by inoculation or through insect hosts, notably ticks; however, there have been several reported instances implicating natural waters as a carrier of this causative agent. The first reported in 1934, in Russia, was an apparent epidemic among hay-field workers. A second reported water-borne outbreak was in 1936 in Turkey. While there are no recorded human infections from natural waters in this country, it is interesting and significant to note that there are a large number of cases reported, principally in the western states, where the source of infection has not been determined and of singular importance is the fact that studies by the Public Health Service have found that streams in that area are continuously contaminated by the tularemia organisms for periods of several months. Because these pathogenic organisms, possibly animal in origin, are found in potential sources of water supplies it, of course, cannot be concluded that this disease can be water-borne but it is a fact that will bear observation and consideration.

While it is a recognized fact that brucellosis is primarily regarded as a disease spread through contact and by products from affected animals, to the sanitary engineer the recorded water-borne epidemic of this disease and reported by a group of investigators, occurring at Michigan State College in 1938-39 has some significance. Furthermore, both of these emphasize the importance of animals as part of our environment and thus the veterinarian as a needed ally of the sanitary engineer.

Recently the sanitary engineer found himself confronted with an illness heretofore not considered as implicating drinking water supplies—methemoglobinemia, which causes a cyonatic condition in infants commonly referred to as "blue babies."

A large number of proven clinical cases now confirms the fact that nitrates as "N" in excess of 10 parts per million may cause the condition in infants. Such nitrate contents in water are not uncommon. Nitrates may occur naturally in ground water or may be present in surface waters from man-made pollution sources.

While the paucity of available data on hypertension (high blood pressure) does not directly point to our drinking water as a cause, the implications do have some basis. In a steadily aging population where a greater percentage of the older group are subjected to degenerative diseases, sodium becomes important. For example, persons seriously affected with a hypertensive disease may require a "salt-free" or very low sodium diet considered to be 200-500 milligrams of sodium per 24 hours. In a water with 200 parts per million of sodium (which is not uncommon) about 400 milligrams per day of sodium would be ingested or an amount significant in certain hypertensive cases. Knowledge of such facts hithertofore seldom if at all evaluated by the sanitary engineer must be part of his "equipment" for the future and merely is cited as another example of the need to consider for tomorrow what may today appear as "obscure" environmental water hazards.

Perhaps what might appear to be a "more obscure" example but one which we dare not lose sight of is the implication of the polysaccharides of two organisms commonly found in our surface water supplies as a possible cause of the disease "multiple sclerosis." The work and clinical experiences (yet unpublished) of the investigations may open a new chapter in our volume of water experiences and serve as another charted point on the route to stimulate and guide the thinking of the more progressive and alert sanitary engineers.

In many phases of our water supply, we have already passed through the era of justification, through the era of methodization, and now truly on the horizon of the socialization or humanization of our water supplies. Whenever we change the quality of water, we are altering our environment—the effects need not be simple, they may become increasingly comples and require the sound and practical leadership of that sanitary engineer who is trained in complete environmental control.

Wastes

The first rule of public health involves the collection and keeping under control our community wastes until they are rendered harmless and inoffensive. Is the outlook for the sanitary engineer in this field to continue to be limited by considering industrial wastes, garbage, refuse and sewage as wastes? This term carries with it the implication of "loss" and how can we become enthused or face future challenges in a field where we are at a psychological disadvantage at the outset. His outlook must be a "new look." He must not think of community wastes but rather of "environmental residues." This term is more than a mere ephemism for it symbolizes a necessary change in attitude and approach. Is not our outlook and perspective broadened if we think in terms of environmental residues—for in reality they are just that, "community left-overs" field with potentials as usable by-products of our environment. Already industrial residues have been converted to dog food, chicken food, bullion cubes, vitamin B_2 for fortifying breakfast foods and hosts of others. From municipal residues, we have secured fats, oils, gas, and lately extracting vitamin B_{12}, from a most productive and common source—sludge from the activated sludge process in municipal sewage-treatment works.

No discussion of future "waste" problems would be complete without considering the radioactive gaseous, liquid and solids and their potential effect on our environment. For example, is the recent radioactive wastes falling as rain in the midwest and the result of radioactive "fall out" from the Nevada A-bomb tests a forerunner of what we may expect and with it potential hazards to lakes, streams and vegetation? The use of radioisotopes in research, diagnosis, therapy, and industry is here to stay. The future of the sanitary engineer in this specialized field depends upon his willingness to face new problems. Radioactivity is a natural phenomenon and the fact that it has been multiplied by intelligence doesn't alter this, neither should he be "frightened" away by those who may chose to cloak its environmental problems in a shroud of "professional mystery." Even though environmental radioactive problems obviously have a beginning, but not foreseeable endings, they should serve to stimulate an excitation of the sanitary engineer's intellectual curiosity. Things are secret only to those who neither know or can understand.

While relatively young in years, our country is reaching its maturity in matters of natural resources. In this broad field of waste treatment the sanitary engineer must hold in his foresight the idea that the protection and proper use of our surface lakes and streams as water resources is a vital national problem. It is vital to the future of the sanitary engineer. He must also have the concept that pollution of these resources is not solely a problem of public health, nor fish and wild life, nor agriculture, nor industry, nor navigation, nor power—but rather it is the combined problem of all these interests and cannot be solved by considering these separately. Practically speaking, pollution is a relative term—it is objectionable only in relation to the intended use of the stream—and thus any material, organic or inorganic, that is discharged into a stream to make the waters unfit for its reasonable intended use can only be termed pollution. Our natural waters are not merely one of nature's gifts existing solely for our social pleasures, but as so completely expressed by Oliver Wendell Holmes "A river is more than an amenity, it is a treasure. It offers a necessity of life that must be rationed among those who have power over it." This keynotes the need for the sound economic approach that must be that of the sanitary engineer not of tomorrow, for that may be too late, but of today.

The outlook of the sanitary engineer in the entire field of waste and water utilization is dependent upon his technical ability to translate the practical utilization of our industrial and community residues in terms of basic sanitary engineering principles, and on his vigilance in protecting our greatest resource—water, coupled with his broad, sound, economical, and practical approach to the reasonable uses of this resource.

Air

One of the greatest fields for the expansion of the sanitary engineer and one virtually yet untouched is that of atmospheric or air pollution control. By definition, pollution of the air is the emission into the atmosphere of harmful or obnoxious contaminants. Its health implication, demonstrated detrimental effect on plant and animal life, economic aspects of physical damage to structures, are real and are here to stay. Pollens, air-borne spores from interior or exterior mold growths, sheer dirt, dust, products of combustion,

gas, fogs, mists, should share the attention of forward-looking sanitary engineers as air pollutants. Yes, even noise should gain attention as a potential pollutant of the atmosphere. The outlook for the sanitary engineer in this latter phase must be broadened to include the entire "acoustical spectrum" of noise, "wanted and unwanted." Also, is it out of reason to conjecture that as part of atmospheric control, air-conditioning systems in buildings might provide a new medium for the mass distribution of beneficial substances such as immunization for specific diseases.

Again in this field, health, agricultural, and meteorological aspects reemphasize the need for active collaboration by the sanitary engineer and allied profession.

Shelter

In perhaps no other field is the outlook for the sanitary engineer more dependent upon the concept or interpretation of terms than in "housing." To consider housing as "shelters built by governmental agencies" or merely as "slum clearance" is unfairly confining to restricted boundaries the activities of this important field. Housing in its broadest sense provides the WHERE we live, sanitation the WHY and HOW. Sanitation is the foundation on which housing is built and with this concept the work of the sanitary engineer in the housing field assumes boundless proportions. Health depends on where we live—on our housing, its benefits are real, tangible for a people's vitality does reflect their locality.

Food

There should be no need to emphasize to our profession the basic necessity for preventing illness and promoting our well-being by controlling the environmental aspects of what we eat and drink. This field of food sanitation holds one of the greatest potential health and economic challenges to the sanitary engineer. One-half of the population of this country derives its income from the production, processing, handling and distribution of food. Annually, over twelve billion dollars are spent by persons in public eating and drinking places and daily over seventy million meals are prepared and served. In his "outlook" many sanitary engineers "overlook" professional possibilities and responsibilities and are standing by figuratively and literally watching other groups enter and " take over" the important environmental functions in the food, milk and beverage field. Our challenge in the food and beverage field is double-barreled—the challenge of the physical equipment and engineering techniques involved and of greater professional importance, the challenge to recognize and actively pursue this field as a basic and vital public health environmental activity.

Natural Environmental Hazards

It has been said "To accept nature without revision is to invite disaster." Ever present are natural obstacles to man's healthful and comfortable living.

Certain plants, insects, and animal life influence our ability to live and thrive in our environment and these should become the concern of the sanitary engineer for many of these problems will influence his perspective of tomorrow.

Insects, animals and plants form part of our natural environment. The diseases transmitted by flies, mosquitoes, lice, ticks, ets., are all too well known to the sanitary engineer. Also of the 83 communicable diseases listed by the American Public Health Association which are of public health importance, 30 are derived from animal sources. These emphasize their importance. Time does not permit even a mere mention of all the "insect and animal and plant spectrum of disease"and their potentialities—only one is cited as a typical example.

One virtually untouched field, and rich with potentialities, is that of aquatic algae growths—suprisingly as this might appear to some of you; to the sanitary engineer algae has principally been objectionable tastes and odors in domestic water supplies and in some instances indicators of stream conditions in pollution control. The possibility of algae causing poisoning of animals or man has not provoked much interest among the sanitary engineering profession. Possibly one reason is the lack of tangible evidence incriminating algae as an actual public health environmental problem. That some algae are pathologic to animals under certain conditions in at least part of their life cycle seems to have been proven in a number of instances. Time does not permit a recital of the interesting examples where algae has poisoned animals. In one instance evidence points strongly to the possiblility of algae toxins passing through a municipal water-treatment plant and causing several thousand cases of gastro-intestinal upsets. The literature has not established thus far a clear-cut symptomatology for algae intoxications in either animals or birds. The sanitary engineer whose principal public health responsibility is the effect of environment on man must keep in mind that some algae organisms have already proven lethal to animals and have never proven not lethal or toxic to humans. This is but another example of the need for close working relationship with the allied professions such as the biologist and the veterinarian.

In our "improvement on nature" a note of caution and warning is sounded. This era of "socialization in sanitation" has brought with it many ersatz solutions. The sanitary engineer of tomorrow must be prepared to evaluate their environmental effects both from a short and long term consideration. We are living in a day of "just as good substitutions" where we are attempting to synthesize, modify and fortify nature in every field of our environment—yes, even the dairy cow has not escaped. We must be able to intelligently decide whether in our modifications of hazards afforded by nature we are not substituting an even greater potential hazard created by man.

Man-Made Hazards

In our zeal to advance, some aspects of our health and well-being are often sacrificed on the altar of progress. The advantages of harnessing the forces of nature for their use and convenience of man often results in hazards to our daily living. Machines, the forces of electricity and products of chemistry, biology, atomic energy have resulted in dangers to workers, accidents away from and at home, toxicity of our soil, water, food, and air. Structures for working, living and playing have contributed environmental hazards to our way of living.

It would seem logical that coupled with our ingenuity to create is our ability to control. Where solutions to man-made environmental hazards have not been found, it merely indicates insufficient effort on the part of the profession responsible for their creation. Coupled with the lack of such effort has been the need for stimulus and leadership by our own profession. The solutions to many of these man-made environmental problems is admittedly not simple. We can know some of the answers only where we can study man in his environment where he actually exists—and not in a test-tube laboratory experiment. In the majority of instances, problems of industrial production are closely interwoven into the public health sanitation solution. Industry is not a static activity—sanitary engineering should not be, it cannot be if we are to keep abreast of living demands. Mutual understanding, yes, more than that, mutual confidence with industry is a prime requisite for the solution of sanitation problems involving products of industry. Changes and advances in industrial sanitation methods and equipment to meet public health demands and environmental needs are the principal factors from which can result a quality of health exceeded by no other nation. They are likewise the factors which can determine the future of the sanitary engineer in this field if his future thinking is not characterized by his limited thinking in the past.

Problems that will create challenges for the future to those working in the environmental sanitation field are not necessarily those problems involving engineering techniques and methods. If we are to translate the broader concepts of public needs into sound and economical engineering administration and progress the real challenge in the outlook for the sanitary engineer is his desire and ability to be part of a team.

The outlook for the sanitary engineer must include the knowledge that we are living in an age of synthesis—that our engineering specialty is a part of something else. The true "success story" of the sanitary engineer of tomorrow is dependent upon his fitting his part into the total picture. No field of engineering demonstrates better than the field of sanitation the importance of combining and blending the qualities of different sciences and different professional personnel to achieve better health for the people. Sanitation is becoming increasingly the task of specialists in fields that show a tendency to grow progressively narrower. There is a recognized danger in this trend for an engineer may be filled with a jargon of his particular speciality and know all of its literature and ramifications but more frequently than not will then regard the next subject or one allied with his work as something belonging to a colleague and will consider any real interest manifested on his part as an unwarranted intrusion. The opposite, which is an equal hazard, is likewise often observed of the person who invades all fields unprepared and with little or no knowledge or appreciation of its problems. For example, if the difficulty of an environmental problem is animal in essence then ten sanitary engineers ignorant of veterinary medicine would get as far as one such engineer and no farther. The same applies conversely to a veterinarian in his approach to an engineering problem, but if a veterinarian who might know little actual sanitary engineering works together with a sanitary engineer who knows little veterinary medicine and if the one will be able to state his problem in terms that the other can manipulate, then the second will be able to put his answers in some form the first can understand. The veterinarian was merely selected as an example but what is true for him can be equally applied by the sanitary engineer to the chemist, bacteriologist, biologist, the doctor or dentist.

The most fruitful areas for growth in the sanitary engineering field of environmental sanitation are those which have been neglected as no-man's land and which lie between the several recognized established fields of environmental activities. The middle ground or boundary regions between the seven normally defined activities of the sanitary engineer and the various other technical workers allied with him offer some of the richest opportunities and challenges. There is a recognized need for the exploration of many of these blank spaces on the public health sanitation map which not only involve but require a mutual appreciation by both the sanitary engineer and his fellow workers. All must be in the habit of working together, of knowing each other's intellectual customs, recognizing, and above all, appreciating the significance of his colleague's suggestions. I again want to cite the veterinarian as an example only because the need for his skills is becoming increasingly important and yet not too often realized or appreciated by the sanitary engineer in a modern environmental control program. In problems involving engineering and veterinary medicine, the engineer need not have the skill to perform a pathological animal examination but he should have the knowledge to appreciate its importance and significance as applied to the problems of his particular field. Like-wise the veterinarian need not be able to understand the technicalities, for example, of a waste-treatment process but he should be able to grasp its sanitary significance and advise the sanitary engineer what he should look for in applying its results to animal health. Progress in sanitary engineering can only come by overcoming any reluctance to move into fields of environmental activities peripheral to those traditionally recognized.

The entire profession of engineering can rise with the broader concept of sanitation. The expansion and outlook for sanitary engineers to meet the new professional challenges are not primarily problems of new engineering methods and techniques for these are only tools, but rather are dependent upon the ability of those in the profession to combine their joint efforts with allied profession in the field of environmental control to meet the demands of the people for quality living.

We must come to realize that sanitation, the workshop of the sanitary engineer, can no longer be defined as "just another" so-called activity of some political subdivision—it is more than water, sewage, garbage, or rats; in its modern concept sanitation is the where, the why, and the way of living expressed by the clean home, the clean farm, the clean neighborhood or community. Being a way of living it must and it will come from within the people, but can and must be stimulated by the progressive outlook of the sanitary engineer himself.

It must be nourished by knowledge—by the creed "I know"—sanitation education is synonomous with public needs—and the sanitary engineer's application of that education must have as its objective to influence public demands to conform to public needs. Sanitation has, is, and will continue to grow as an obligation of the sanitary engineer in his mutual relations within his own profession and with all those allied with it.

The modern concept for sanitation and its potential benefits, both to the public and our profession, form a large part of our working capital—it behooves us as sanitary engineers not to sell it short. Never before was it more vital that we in sanitary engineering realize that cooperation not only within our own profession but with all those that can be allied with us, is no longer a mere expression of sentiment but is truly an engineering economic necessity.

Our future, our field of sanitation today is a dollars-and-cents investment in the WHERE, the WHY, and WAY of living—the outlook and the future of the sanitary engineer is dependent upon his ability today to make that investment pay the greatest possible dividends tomorrow—upon the breadth of his environmental concept that he can protect today for tomorrow man's most precious possession—health. That's the real answer to the question—What's the outlook for the sanitary engineer—His future is now!